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Foreign Animal Disease Report

United States
Department of Agriculture

Animal and Plant
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Veterinary Services

Emergency
Program



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Emergency Field Investigations

During the first quarter of Fiscal Year (FY) 1990 (October 1, 1989, to December 31, 1989), veterinarians from the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, conducted 44 investigations of suspected foreign animal diseases to eliminate the possibility that an exotic disease may have been introduced into the United States. All investigation results were negative for exotic disease conditions.

Emergency Programs Activities

Foreign animal disease training courses were presented March 18-31, 1990, and May 6-19, 1990. The courses were scheduled for 1 week in Ames, Iowa, at the National Veterinary Services Laboratories (NVSL), and the second week at Plum Island, New York, at the Foreign Animal Diagnostic Disease Laboratories (FADDL). Parts of the course curriculum formerly presented at Hyattsville, Maryland, have either been discontinued or incorporated in the NVSL or FADDL sessions. Other scheduled courses are: (1) Wildlife Disease Seminar, July 23-27, 1990, Athens, Georgia; (2) Military Support Course for Military Veterinarians, April 9-13, 1990, Hyattsville, Maryland; (3) Foreign Animal Diseases Course for Laboratory Diagnosticians and Teachers of Infectious Diseases, November 1990, Plum Island, New York.

Secretary's Advisory Meeting

The Secretary of Agriculture's Advisory Committee on Foreign Animal and Poultry Diseases met February 27-28, and March 1, 1990, at the National Center for Animal Health Information Systems (NCAHIS), Ft. Collins, Colorado. First day topics of discussion included APHIS objectives for 1990, a report on actions taken on 1989 recommendations, and reports on activities of the Plum Island Animal Disease Center (PIADC), the National Veterinary Services Laboratories (NVSL), International Services (IS), Science and Technology (S&T), and Veterinary Services (VS).

On February 28, 1990, a tour of the NCAHIS facilities was conducted. The Director and Staff briefed the Committee on the NCAHIS mission, plans, support systems, organization for emergency preparedness, and other activities.

Received by: VLS

Indexing Branch

The Committee met in executive session, March 1, 1990, to develop resolutions and recommendations and to prepare their report. Thirteen resolutions and recommendations were approved and forwarded to the Secretary's office. Included were recommendations on funding and x-ray crystallography activities at PIADC, support for foot-and-mouth eradication in the Western Hemisphere, a test exercise for simulated African horse sickness (AHS) eradication, testing and quarantining equidae other than horses for AHS, and the possibility of procuring, purchasing, and evaluating AHS vaccine. Other recommendations concerned the introduction of exotic diseases by international travellers, bovine spongiform encephalopathy, scrapie, transmissible mink encephalopathy (TME), bont ticks on the Caribbean island of Antigua, permits and notification of State officials of animal imports, strategic plans for emergency disease response and foreign animal diseases, a national center for import/export, compliance with import rules, responsibility for all import requirements for animals, Smith-Kilborne lectureship training, and the APHIS infrastructure for disease control and emergency response. All 19 members of the Committee attended the meeting. (See 17-4:13 for membership roster.)

Rabbit VHD Update

Work recently completed at FADDL supported the contention that jack rabbits are not susceptible to viral hemorrhagic disease (VHD, synonym: necrotic hepatitis virus of rabbits). Inoculated jack rabbits did not develop clinical signs or other evidence of the disease. An earlier study at FADDL demonstrated that cottontail rabbits are not susceptible to VHD. (Dr. M. A. Mixson, Emergency Programs, VS, APHIS, Hyattsville, Maryland 20782, (301) 436-8073)

Salmonella Control Program

On February 16, 1990, the U.S. Department of Agriculture (USDA) announced a control program to reduce levels of *Salmonella enteritidis* serotype enteritidis (SE) in table egg poultry flocks in the United States.

The SE program is outlined in an interim rule that was published in the February 16, 1990, Federal Register (F.R. Vol. 55, No. 33, Rules and Regulations). The rule covers two areas: (1) egg-type breeding flocks will be required to participate in the U.S. Sanitation Monitored Program of the National Poultry Improvement Plan or an equivalent State plan that tests and certifies flocks—before hatching eggs and chicks can be shipped interstate; and (2) commercial egg-laying flocks that have been epidemiologically linked to human outbreaks.

An APHIS task force, under the direction of Dr. Thomas J. Holt, was established in Hyattsville, Maryland, to develop the procedures and guidelines for implementing the SE program. On May 11, task force direction was transferred to Dr. Chester A. Gipson. The task force provides direction and assistance to field operations and serves as the national information center for SE involving egg-type production flocks in the United States.

Responsibility for regulating food safety issues associated with SE contamination of eggs is distributed among several Federal agencies. APHIS is responsible for preventing the spread of communicable diseases of poultry such as SE in order to protect the livestock and poultry of the United States. The Agricultural Marketing Service (AMS) has authority for certain aspects of egg production safety, including pasteurization and other processing activities. The Food and Drug Administration (FDA) of the Department of Health and Human Services (HHS) is responsible for

preventing the spread of communicable diseases that are a threat to humans, and otherwise ensuring the safety of the human food supply.

APHIS statistics for 1989 show 77 human SE outbreaks, with at least 1,944 cases and 13 deaths, compared with 1988 statistics from the HHS Centers for Disease Control, showing 37 SE outbreaks, with 956 cases and 8 deaths. About 70 percent of the outbreaks traced to a known food source were associated with shell eggs. Poor food handling was also a contributing factor in most of these cases.

The SE Task Force is located at Room 741, Presidential Building, 6525 Belcrest Road, Hyattsville, Maryland 20782. The telephone number is (301) 436-4363. The FAX number is (301) 436-8360. (Ms. Margaret Webb, USDA, LPA, PI, Hyattsville, MD 20782, (301) 436-6573)

Foreign Animal Disease Update

The Office International des Epizooties (OIE) reported the following diseases during October, November, and December 1989:

In South America, Argentina reported 15, 23, and 85 outbreaks of types O, A, and untyped **foot-and-mouth** disease (FMD) respectively during June through August 1989. Brazil reported 629 outbreaks of FMD, with type C reported in January and February 1989, and five cases of type A. Colombia reported 9 outbreaks of untyped FMD, 215 outbreaks of type A, and 11 of type O, occurring from September to November. Ecuador reported FMD types A and O from May through November. Paraguay reported 11 outbreaks of type O in October and November. Uruguay reported 115 cases of FMD type O in cattle during September. Additional outbreaks of FMD occurred in Paraguay, but the subtypes were not determined.

The Union of Soviet Socialist Republics (USSR) reported outbreaks of FMD type O during May, September, and December.

In the Middle East, Jordan reported outbreaks of untyped FMD in cattle, sheep, and goats from January through July. Cases of FMD type O were reported there in December. Israel reported 60 cases of type O₂ in cattle during December 1989. Cases of untyped FMD were reported in Oman between August and October. FMD type Asia-1 was also reported in Oman in November. Turkey reported 56 cases of untyped FMD in September and October, 4 outbreaks of type O in November, and 20 cases of type A in 8 outbreaks during September through November. The Republic of Yemen reported the occurrence of FMD type O in November.

In Africa, Chad reported outbreaks of FMD from August through November; Ethiopia reported outbreaks of types A and C in October; Kenya reported cases of FMD during August; and Namibia reported 340 cases of FMD SAT type 2 during November and December. Tunisia reported outbreaks of type O in December. Zimbabwe reported FMD SAT type 1 in November and type 2 in June, July, and October.

In Asia, Hong Kong reported outbreaks of FMD during September. Iran reported over 201 outbreaks of untyped FMD and type O from April through September. Pakistan reported types A, O, and Asia 1 during September, October, and November. The Philippines reported 1 outbreak involving 15 swine cases of type C during August. Thailand reported occurrences of type O in cattle, buffalo, goats, and swine during January through May.

Colombia reported outbreaks of **vesicular stomatitis** (VS) types Indiana (IN) and New Jersey (NJ), involving 435 cases during September through November. Costa Rica reported cases of VSNJ during July, August, and October, and untyped cases in September. Ecuador reported outbreaks of VSIN during July through November. El Salvador reported outbreaks of VSNJ in July, August, and October. Guatemala reported 12 outbreaks of VSNJ during July through October. Honduras reported 17 outbreaks of VSNJ during the same period. Nicaragua reported VSNJ in September and VSIN in October. Panama reported VSIN and VSNJ during September and November. Venezuela reported VSNJ in November. Mexico reported 44 outbreaks of VS involving 111 animals in September, 226 animals in October, and 300 animals in November.

Ethiopia reported outbreaks of **rinderpest** (RP) during September and October, and Oman reported an outbreak in September, involving six cases.

The Ivory Coast reported outbreaks of **peste des petits ruminants** (PPR) during September through November. Nigeria reported PPR outbreaks in February. Oman reported 10 PPR outbreaks during August, September, and October, and Senegal reported 360 cases in July.

Contagious bovine pleuropneumonia (CBP) was reported in Nigeria in February, in Ethiopia and Spain in October, and in the Ivory Coast September through November. Kuwait reported 44 cases of CBP, Mali reported 5 outbreaks and 54 cases of CBP, October through November. Kenya reported an outbreak of CBP in September.

Egypt reported 19 outbreaks of **lumpy skin disease** (LSD) in September and October, and Kenya and Ethiopia reported outbreaks in September through October, respectively. Ghana reported 17 outbreaks of LSD in July and August; Israel reported 60 cases in September (see article in this issue); and the Ivory Coast reported outbreaks in September, October, and November. Madagascar reported 66 outbreaks of LSD from May through August. Namibia reported 250 cases of LSD in December; Senegal reported outbreaks in May, June, and July; and South Africa reported outbreaks in September, October, and November. Zambia reported 37 cases of LSD in January 1989, 4 cases in July, and 2 in August; and Zimbabwe reported 9 outbreaks in July and August, involving 162 cases.

Zimbabwe reported a case of **Rift Valley fever** (RVF) in June; and Zambia reported outbreaks in June, July, and August, involving 88 cases. South Africa reported RVF outbreaks in October.

Israel reported outbreaks of **bluetongue** (BT) in July, September, and November; Jordan reported 38 cases in July; and South Africa reported outbreaks in September, October, and November. The United States reported BT in October and November.

In Africa, Algeria reported 18 outbreaks of **sheep and goat pox** (SGP), involving 140 cases during September; Ethiopia reported outbreaks in October; and the Ivory Coast reported outbreaks during September, October, and November. Morocco reported 22 outbreaks of SGP involving 93 cases during the last quarter of 1989; Senegal reported outbreaks during May and June; and Tunisia reported 32 outbreaks May through October.

In the Middle East, Jordan reported SGP outbreaks involving 900 cases in goats, sheep, and camels during the first 8 months of 1989. Kuwait reported 50 SGP outbreaks involving 136 cases in sheep during September through November; Oman reported outbreaks during August through October; and Turkey reported 355 outbreaks during September, October, and November, involving 3,997 cases in sheep and goats, with 183 deaths.

In Asia, Iran reported 88 SGP outbreaks occurring from April through September; and Pakistan reported outbreaks during September, October, and November.

Ethiopia reported outbreaks of **African horse sickness** (AHS) in October, 7 outbreaks involving 250 cases in November, and no cases in December. Portugal reported 4 outbreaks of AHS in September and 39 in October. South Africa reported AHS outbreaks from September through November, 39 of them in October. Spain reported 16 AHS outbreaks involving 34 cases in October, and 2 outbreaks involving 3 cases in November.

Italy, Spain, and Portugal reported outbreaks of **African swine fever** (ASF) during October through December. Portugal reported the highest number of outbreaks per month: 13, 15, and 19, respectively. Malawi reported ASF in September and Zambia reported outbreaks in July and August.

In South America, Argentina reported outbreaks of **hog cholera** (HC) during June through August. Brazil reported 64 outbreaks of HC, involving 779 cases during the first half of 1989; Colombia reported outbreaks September, October, and November; and Ecuador reported outbreaks from May through November. Uruguay reported 5 HC outbreaks in September; and Mexico reported 240 outbreaks involving 1,011 cases in September, 18 outbreaks involving 785 cases in October, and 80 outbreaks involving 88 cases in November.

In Europe, Austria reported 4 HC outbreaks involving 116 cases in October and November; Belgium reported outbreaks in October; and Germany reported 13 outbreaks involving 447 cases in October, and 10 outbreaks involving 200 cases in November. Italy reported HC outbreaks each month during the last quarter of 1989. Poland reported an outbreak of HC in September, and the USSR reported outbreaks in September.

In Africa, Madagascar reported HC outbreaks in May, June, and August; and Mauritius reported outbreaks in September.

In Asia, Hong Kong reported HC outbreaks in August, September, and October; Korea reported outbreaks in September, October, and November; and the Philippines reported outbreaks during April through September involving 5,131 cases. Taiwan reported 243 cases of HC in 9 outbreaks during October and November.

Madagascar reported 25 outbreaks of **Teschen disease** (TD) during May through August.

Newcastle Disease (ND) (untyped and presumed to be velogenic viscerotropic) was reported from 29 countries. Albania reported 2,753 cases of ND during September; Yugoslavia reported outbreaks during August and September; Germany and Italy reported outbreaks in October; and Belgium reported outbreaks in November. Turkey

reported 9,540 cases of ND during September through November; and Iran reported 122 outbreaks during January, February, March, and August. Tunisia reported 53 outbreaks of ND during June through August; Ethiopia and the Congo reported outbreaks in October; Kenya reported outbreaks in September; the Ivory Coast reported outbreaks during September through November; Botswana reported outbreaks in October and November; and Zambia reported 44 outbreaks involving 13,967 cases during January and June through August. Madagascar reported ND during May through July. Colombia reported outbreaks of ND in September and October; Ecuador reported outbreaks in October; Brazil reported 132 outbreaks involving 41,803 cases during January through June; and Mexico reported 2,556 cases during September through November. Hong Kong reported ND in September and October, and Korea reported outbreaks in September and November. Malaysia reported 13,154 cases of ND in 9 outbreaks in July and August; and the Philippines reported 33,252 cases during April through September.

Ecuador reported outbreaks of **velogenic viscerotropic Newcastle disease (VVND)** during October; Mauritius reported 25 outbreaks during July and August; Pakistan reported outbreaks during October and November; and the USSR reported outbreaks during October.

No cases of **swine vesicular disease (SVD)** or **fowl plague** were reported for October, November, and December 1989.

Bovine spongiform encephalopathy (BSE) in Great Britain increased sharply during the 3-week period ending February 16, 1990 (138, 205, and 300 cases, for the respective weeks). The total number of confirmed cases since June 1988 is 10,298, on 5,823 farms.

Libyan authorities reported 149 cases of **screwworm myiasis (SM)** in October, compared with 82 in September. All of these cases were observed in previously infested municipalities (see 17- 4:7). (Dr. M. J. Gilsdorf, USDA, APHIS, IS, OS, Hyattsville, MD 20782, (301) 436-8892)

Pox in European Zoos

Between 1960 and 1989, a total of 25 outbreaks of pox disease occurred in exotic mammals in European zoological gardens. All but 2 of the outbreaks were within approximately 535 miles of Magdeburg, German Democratic Republic. The other two were at the Moscow Zoological Garden, Union of Soviet Socialist Republics (USSR). Asian elephants (*Elephas maximus*) were involved in 18 of the outbreaks, African elephants (*Loxodonta africana*) in 6, okapies (*Okapia johnstoni*) in 2, rhinoceroses (*Ceratotherium simum*, *Diceros bicornis*) in 2, and different species of the family Felidae and order Edentata in 2. The most recent outbreak, during March and April 1989, was the most lethal one. It occurred in a travelling circus at Wuppertal, Federal Republic of Germany, where three of five Asian elephants died.

Clinical Picture. Predominant signs were the characteristic lesions of the skin and mucosa, in most cases at the head and trunk. These varied from 0.5 to 3.0 cm diameter. All classic stages of pox efflorescences were found: papular, vesicular, and pustular. In at least three outbreaks, a loosening of the horn skin of the elephant's foot was observed, causing severe pain and necessitating the humane destruction of one elephant. In each outbreak, one or two animals either remained healthy or showed a very mild form of the disease. Severe pulmonary pox disease was observed only in exotic cats at the Moscow Zoo.

Diagnosis. Diagnosis was based on the typical clinical picture and the demonstration of pox virus particles by electron microscopy in negatively stained material from skin lesions.

The presence of virus was confirmed by the production of lesions in chorioallantoic membranes 48 or 72 hours after inoculating 12-day-old chicken embryos with a suspension of triturated lesion material.

Virus. All 11 strains of virus that were isolated belong to the genus Orthopoxvirus and are cowpox or cowpox-like. All produce 1-2 mm lesions in chicken embryo allantoic membranes. The lesions are grey, with hemorrhagic centers. The intracytoplasmic inclusions are of type A V+ (inclusion bodies containing embedded virus particles). However, the DNA restriction pattern of each strain is unique, so that each strain can be rather easily distinguished from another. (Pilaski, J. et al. 1986. Arch. Virol. 88: 135-142; Pilaski, J. and A. Roesen-Wolff 1988. In: Darai, G. ed. Virus Diseases in Laboratory and Captive Animals, Martinus Nijhoff Publishers, Boston, 83-100)

Epidemiology and susceptibility. In at least four instances, characteristic skin nodules 1-2 cm diameter were seen in humans having contact with sick elephants. Similar skin lesions were observed in humans after having contact with domestic cats, wild-living rodents, or both. All virus strains isolated from the human cases were cowpox-like viruses. (Roesen, A. et. al. 1987. Med. Microbiol. Immunol. 176:181-188)

Although rodents are considered a likely reservoir for cowpox-like viruses, cowpox-like viruses have only been isolated from wild rodents in the USSR. Asian elephants are highly susceptible to cowpox-like virus strains. Circus elephants are more likely to be exposed than zoo elephants, because they are travelling around and, therefore, have a greater chance of coming into contact with the virus. The route of infection is probably through contaminated hay.

It is desirable to vaccinate all captive elephants within the endemic area of cowpox-like viruses. Dr. J. Pilaski and co-workers at the Medical Institute of Environmental Hygiene, Duesseldorf, used a combined vaccination procedure consisting of a first subcutaneous vaccination with the MVA strain (modified vaccinia virus Ankara), and a second vaccination 4 weeks later by skin scarification with the Elstree strain of vaccinia virus. The MVA vaccine was developed by Dr. A. Mayr, Munich. The use of vaccinia virus was based upon the advice of Dr. J. Foster, Seattle, Washington. The only reaction to vaccination was seen after 5 days as a local reddening and swelling of the skin. Neutralizing antibody titers of 1:8 were found 4 weeks after the second vaccination. In contrast, elephants who survived pox disease had neutralizing antibody titers up to 1:1024. (Dr. J. Pilaski, Medical Institute of Environmental Hygiene, D-4000 Duesseldorf, Auf'm Hennekamp 50, FRG)

FMD in Tunisia

FMD in Tunisia. The following was adapted from a February 1990 report by Dr. Juan Lubroth, Veterinary Medical Officer (VMO), APHIS, International Services, Mexico-United States Commission for the Prevention of Foot-and-Mouth Disease and Other Exotic Diseases of Animals, Mexico City, Mexico.

On December 12, 1989, the Virus Research Institute, Pirbright, England, confirmed foot-and-mouth disease (FMD) type O Mateur Tunisie 89, in Tunisian sheep. FMD had not been diagnosed in Tunisia since 1982, and then primarily in cattle. High mortality was reported in the 1989 lamb crop beginning during early November in the

Gouvernorat of Le Kef, near the Algerian border. Shortly after the veterinary services of the Ministry of Agriculture assessed the extent of the problem, government authorities decided to vaccinate the more than 7.4 million susceptible animals in the country. The border with Libya was closed on December 5. Although livestock markets were closed, abattoirs continued to operate under auspices of the Ministry of Agriculture, and animals remained on ranges throughout the country. By early December, some 400 vaccinating brigades began administering the FMD type O₁ vaccine already available in local pharmacies as either monovalent vaccine or as a component of trivalent vaccine. Additional FMD type O₁ vaccine arrived from France by December 14, and 6.2 million doses of vaccine had been administered by January 17, 1990.

At the request of the USDA's Foreign Agricultural Service, relayed through the U.S. Department of State, APHIS International Services Veterinary Medical Officer (VMO) Dr. Juan Lubroth and VS VMO Dr. Thomas Shumaker travelled to Tunisia during January 1990, as veterinary advisor and observer to the Republic of Tunisia.

The 1989-90 outbreak affected sheep and goats in 22 of the 23 gouvernorats comprising the Republic of Tunisia, and cattle in approximately 15 northern and central gouvernorats. Only the southernmost Gouvernorat of Tataouine reported no FMD.

Tunisian dairy cattle are ordinarily given FMD vaccine purchased from Rhone-Merieux, Lyon, France. Although sheep and cloven-hoofed animals other than dairy cattle usually are not vaccinated for FMD, annual vaccination for sheep pox and enterotoxemia and treatment against mange are required.

By January 24, over 83 percent of Tunisia's livestock were vaccinated with either monovalent or trivalent FMD vaccine. Totals vaccinated included 5,312,251 sheep, 511,337 goats, 373,459 cattle, and 2,785 camels (*Camelus dromedarius*). A total of 2,212 flocks of sheep were affected.

By January 18, over 51,000 animals died, 50,836 of them sheep. The Gouvernorat of Kairouan was most severely affected, having sustained 29 percent of the total deaths of sheep. Only 9 percent of the total affected premises are located in Kairouan.

An estimated 2.5 percent of the total sheep population of Tunisia was affected by FMD. Eighty percent of the deaths were attributed to FMD virus-associated myocardial necrosis, with the balance due to other possible causes, such as enterotoxemia. Increased incidence of enterotoxemia was attributed to lush pastures that resulted from heavy rains throughout the country during November, December, and January.

The source of the FMD outbreak in Tunisia is uncertain. FMD virus type O Manisa was originally identified in the Asia Minor region of Turkey, and reportedly has occurred in the USSR. Both Libya and Algeria claimed to have had FMD outbreaks subsequent to the appearance of the disease in Tunisia. Animal traffic between Tunisia and both Libya and Algeria is usually heavy. Dromedary camels frequently cross the nearly ungovernable eastern border with Libya, and goats, particularly of Libyan origin, regularly arrive via the Sahara to be sold in Tunisian markets ("souks"). In contrast, most entering sheep are from Algeria.

A revaccination program was planned to begin in March 1990, employing monovalent (FMD type O₁ Mateur Tunisia 89, if feasible) vaccine in small ruminants, and trivalent vaccine in cattle and camels. Targeted for revaccination are 3.25 million sheep, 740,000 goats, 450,000 cattle, and 35,000 camels.

A third round of vaccination is also planned for September 1990, prior to the lambing and kidding season, involving 2.5 million adult sheep and 480,000 goats.

Lumpy Skin Disease in Israel

Undoubtedly, the most serious veterinary problem in Israel during 1989 was the country's first outbreak of lumpy skin disease (LSD) in the village of Moshav Peduyim, Beer-Sheva district, bordering the Sinai. Clinical suspicion of LSD was raised approximately 4 weeks after an initial call to a veterinary practitioner regarding health problems on three farms. Allergy was first suspected to be the cause of the observed skin lesions. However, it was soon realized that the condition had spread to additional farms and that serious economic damage was being done due to reduced milk production, loss of body weight, and probably some abortions and deaths. The suspicion of LSD was first raised on 19 August, and the State Veterinary Services was called. Clinical cases were subsequently recorded in 68 animals, including 5 deaths, among 637 Israel-Holstein cattle present on 17 cattle farms of the village. Clinical observations were confirmed by histopathological examinations, electron microscopy of negatively stained specimens, indirect fluorescence tests, and virus isolation.

In attempting to eradicate the disease and prevent the development of an endemic situation, a stamping-out policy was adopted. A total of 168 animals were destroyed, including 63 bovines with clinical symptoms, and 105 young calves. The remaining 464 animals on the 17 affected and unaffected farms in the village were slaughtered. Offal and skins were condemned and destroyed. Strict prohibition of movements in the Beer-Sheva district was enforced. Ring vaccination with a locally produced sheep pox vaccine (which is certified for use in sheep in Israel) was promptly carried out. Premises in the affected village were disinfected. Owners were indemnified, according to existing law. Restocking of the farms was to be considered at least 3 months after the September 29, 1989 completion of depopulation.

Various laboratories abroad provided diagnostic assistance and valuable advice: Central Veterinary Laboratory, Kabete, Kenya; Central Veterinary Institute, Onderstepoort, Republic of South Africa; Plum Island Animal Disease Laboratory, United States; and Pirbright Laboratory, Animal Disease Institute, Great Britain. (Adapted from information received from Dr. A. Shimshoney, Director, Veterinary Services and Animal Health Ministry of Agriculture, P.O. Box 12, Beit-Dagan, 50250, Israel, FAX 3-9681753)

Ostrich Diseases

A recent importation of exotic ticks into the United States on adult African ostriches (see 17-4:2-3, 17-3:5-6) has renewed the interest of many in possible additional pests and contagions to which these interesting and valuable ratites (ostrich, emu, and rhea) may be heir.

Ratites have become popular as alternative livestock in the United States. These birds are extremely valuable and there is intense public interest in them. Ratites are frequently moved interstate, to and from auctions and private sales. There is also interest in the importation of breeding stock from the continent of origin (ostrich-Africa; emu-Australia; and rhea- South America). A recent finding of tick vectors of *Cowdria ruminantium*, the rickettsial agent of heartwater, on newly imported ostriches prompted

concern by regulatory agencies. The following thoughts on known infectious and parasitic disease of ostriches are offered to acquaint regulatory officials and other interested people with these birds.

Ostriches are susceptible to Newcastle viruses, but not markedly so. The infectious diseases reported in ostriches also occur in many other orders of birds, and include tuberculosis (*Mycobacterium avium*), avian pox, aspergillosis, candidiasis, salmonellosis, pseudomoniasis, klebsiellosis, colibacillosis, pasteurellosis, staphylococcosis, and chlamydiosis (in a bird, kept in a room with macaws). Ostriches are unique among avian species in that they are susceptible to anthrax.

The lice of ratites are likely host specific (*Struthionis* sp. and *Stouthioliperus* sp.). Ostriches have their own species of hippoboscids flies: *Hippobosca struthionis*. Other external parasites of ostriches are not host specific.

Intestinal coccidia (Isospora) are of little clinical importance in ostriches and are not likely to infect domestic galliformes or anseriforms. Although there is no definitive literary source for information on the internal parasites of ostriches, reports of certain parasites have been cited in the periodical literature, including reports on *Libyostrongylus douglassi*, *Codiostomum struthionis*, *Dicheilonema filiform*, *Dicheilonema spicutarum*, *Ascaridia struthionis*, and *Houttuynia struthionis*. (Dr. Murray E. Fowler, School of Veterinary Medicine, University of California, Davis, CA 95616)

FOCUS ON — Getah Disease In Horses

Getah virus can cause an acute or subacute disease in horses, characterized principally by fever, edema of the hind limbs, and an urticarial rash on various parts of the body. It is a mosquito-borne disease that is uniformly non-fatal in susceptible horses. The virus may also cause a fatal peracute syndrome in neonatal piglets.

Originally isolated in Malaysia in 1955, Getah virus was subsequently recovered from mosquitoes in several other Asian countries, and Australia, and from healthy pigs in Japan. While serologic evidence of infection with this or closely related viruses has been reported in man, horses, cows, pigs, and birds, Getah virus was, for many years, regarded as non-pathogenic for vertebrates. It was not until late 1978, with the occurrence of an epizootic of an acute febrile disease among racehorses in Japan, that the pathogenicity of this virus was first established. Getah virus has since been shown to be highly pathogenic for newborn piglets.

Etiology

Getah virus is an RNA virus and a member of the *Alphavirus* genus of the *Togaviridae* family. It belongs to the Semliki Forest antigenic complex within this genus whose members comprise the Semliki Forest, Mayaro, Chikungunya, Una, O'nyong'nyong, Bebaru, Getah, Sagiya, and Ross River viruses. Based on antigenic relationships as determined by cross-virus neutralization, hemagglutination inhibition, and complement fixation tests, Getah, Sagiya, Bebaru, and Ross River have been further classified and placed in a Getah virus subgroup, within which Getah and Sagiya viruses are more closely related to each other than to either Bebaru or Ross River viruses. Itakura and Haruna viruses, both isolated in Japan, are no longer regarded as additional members of this subgroup, but appear to be identical to Sagiya and Getah viruses, respectively.

Getah and closely related viruses, like other members of the Alphavirus genus, contain three major antigenic determinants, one that is type specific, another subgroup specific, and a third that is a broadly reactive group determinant. Two envelope proteins, E₁ and E₂, and a core protein (C) have been found on sodium dodecyl sulphate polyacrylamide gel electrophoretic analysis of the structural proteins of Malaysian and Japanese strains of Getah virus. Oligonucleotide fingerprint analysis of a range of mosquito, equine, and swine isolates of this virus has demonstrated that there is considerable variation among mosquito-derived isolates and between Malaysian and Japanese strains of the virus. Alterations in antigenicity have been experimentally induced with a strain of Sagiya virus following multiple serial passages in Vero kidney cell culture.

Getah virus is readily inactivated by deoxycholate and lipid solvents. It can be propagated in suckling mice and in a range of human, monkey, bovine, swine, and hamster cells, but not so well in equine cells. Viral replication in cell culture occurs with the development of cytopathic changes, plaques, and the attainment of moderately high infectivity titers.

Geographic Distribution

Since its original isolation from *Culex gelidus* and *Cx. tritaeniorhynchus* mosquitoes in Malaysia in 1955, Getah or closely related viruses have been found to be widely distributed in various Asian countries and Australia. The virus has been isolated from mosquitoes in Malaysia, Kampuchea, Thailand, Indonesia, Japan, Australia, and Mongolia, and from pigs and horses in Japan. Additionally, there is serologic evidence of its presence in Vietnam, South Korea, and the Philippines.

Following the initial isolations of Sagiya virus from *Cx. tritaeniorhynchus* and *Aedes vexans* mosquitoes in Japan in 1956, serologic activity to this virus was demonstrated in man, pigs, horses, and herons. The highest prevalence of infection (65 percent) was found in pigs on farms close to heronries. In a later serologic study conducted in several districts in Japan, neutralizing antibody to Getah virus was detected in horses 2 years of age and older in every district surveyed between 1972 and 1978. Various seroepidemiologic studies on arbovirus infections in Australia have confirmed the occurrence of Getah virus infection in man, horses, cattle, sheep, and dogs, and certain species of wild vertebrates, i.e., wallabies, kangaroos, and bandicoots in Queensland. While reactions to the virus were widely distributed throughout Queensland, there was a higher prevalence in northern areas. Limited evidence of human infection with Getah virus has also been found in parts of Central and Western Australia.

Hosts

Horses and swine are currently the only two vertebrate species in which clinical disease may develop following natural infection with Getah virus. Occurrence of the disease in pigs appears at least in part to be age-related, insofar as it has only been observed in newborn piglets in which the infection can be fatal.

There is evidence that Getah and Sagiya viruses can replicate in a range of mammalian and avian species. However, such infections have been associated with clinical disease only in horses and swine. Limited experimental studies in cattle have demonstrated that calves inoculated with mouse brain-passaged Getah virus were susceptible to infection. Although remaining clinically normal after challenge, they had histologic evidence of encephalitis when killed 17 days later. Getah virus has been shown to produce subclinical viremic infection in sheep.

Five species of small laboratory animals were found to be susceptible to intraperitoneal and subcutaneous inoculation with Getah virus: guinea pigs, hamsters, mice, rabbits,

and rats. Apart from roughness in coat, all species remained clinically normal. They developed viremias of variable magnitude and duration. Young adult macaque monkeys, however, have been shown to resist infection with this virus.

Transmission and Epidemiology

Getah and closely related viruses are transmitted by mosquitoes. Based on virus isolation results, *Cx. tritaeniorhynchus* appears to be the most significant vector of members of the Getah subgroup in Malaysia, Thailand, Kampuchea, Indonesia, and Japan. Getah virus has been recovered from *Cx. bitaeniorhynchus* and *Anopheles amictus* in Australia, and less frequently from *Cx. gelidus* in Malaysia, and *Ae. vexans nipponii* in Japan. Experimental studies on the susceptibility of various mosquito species to Getah virus have confirmed the vector competence of several strains of *Cx. tritaeniorhynchus* and *Ae. vexans nipponii* for this virus. No significant differences in infection rates were observed between various strains of either species of mosquito. *Aedes japonicus*, *Ae. aegypti*, *Ae. albopictus*, *Cx. pipiens pallens*, *Armigeres subalbatus*, and *Tripteroides bambusa* were also found to be susceptible to experimental infection with Getah virus. Both pigs and horses develop viremias of sufficient magnitude and duration for them to serve as possible amplifying hosts of Getah virus for vector-competent species of mosquitoes.

In studies of the ecology of Sagiya virus in Japan, *Cx. tritaeniorhynchus* and *Ae. vexans* were considered to be the principal vectors involved in transmission of the virus to man, pigs, horses, and herons. Pigs, horses, herons, and perhaps other species of vertebrates were regarded as probable amplifying hosts in the natural history of this virus.

While mosquitoes undoubtedly play a primary role in the transmission and epidemiology of Getah and related virus infections, there is evidence to indicate that spread of Getah virus between horses in close contact may also occur by the aerosol route, since considerable quantities of virus are shed in the respiratory secretions of acutely infected animals. Getah virus infection of horses has been confirmed in areas of Japan outside of the normal periods of seasonal activity of the mosquito vectors.

Signs and Lesions

Acute infection with Getah virus has been associated with disease only in horses and neonatal piglets. The disease in horses is characterized by the development of fever ranging from 38.5°C to 40°C (101.3°F-104°F), serous nasal discharge, urticarial rash on various parts of the body, edema of the hind limbs, and enlargement of the submaxillary lymphatic glands. Affected horses make uneventful recoveries within a week of the onset of clinical signs. Many cases of Getah virus infection are subclinical in nature and evidence of disease may only be seen in up to 22 percent of infected animals. Similar clinical responses have been observed in horses experimentally infected with strains of Getah or Sagiya virus.

The main gross lesions seen in horses experimentally infected with Getah virus and killed between 4 and 11 days after challenge comprise moderate edema and hyperemia of the lymphatic glands throughout the body, especially the splenic and internal inguinal glands; enlargement of the spleen; and scattered maculae in the dermis and edema in the subcutis of horses that developed an urticarial rash. Histologically, the most significant lesion was lymphoid hyperplasia of the spleen and lymphatic glands. Diffuse or perivascular lymphocytic infiltration was observed in association with the cutaneous lesions. Perivascular cuffing with mononuclear cells was present in the cerebrum, especially the hippocampus of some of the infected horses.

While Getah virus infection in pigs is mostly subclinical, the virus has, on rare occasions, been implicated in a fatal peracute disease in neonatal piglets that develops within 2 to 3 days after birth. The syndrome is associated with a very high morbidity and mortality rate. Clinical signs in piglets consisted of depression, muscular tremors, and diarrhea, with death supervening within 1 to 3 days in up to 66 percent of affected animals. No gross or histologic lesions were detected on postmortem examination. The pathogenicity of a strain of Getah virus isolated from natural cases of this disease was confirmed in gnotobiotic piglets inoculated by the intramuscular route. This and other strains of Getah virus were only mildly pathogenic in intramuscularly inoculated adult pigs, indicating that pathogenicity of this virus for pigs is influenced by age.

Diagnosis

While Getah virus can cause a well-defined disease syndrome in horses, the clinical signs produced closely resemble those seen in typical cases of equine viral arteritis or in the mild form of African horse sickness. These diseases cannot with certainty be differentiated from one another purely on clinical grounds. Virologic confirmation of Getah virus infection can be readily achieved by isolation of the virus in suckling mice or in a range of mammalian cell cultures and/or demonstration of a significant rise in specific antibody titer between acute and convalescent sera. The serum neutralization, hemagglutination inhibition and complement fixation test, ELISA and, most recently, dot immunobinding assay have been used for the detection of antibody to Getah virus.

Control

Control of Getah and related virus infections may be attempted by implementation of a vector control program recommended for other arbovirus diseases. This involves disruption of vector breeding sites, reduction of vector populations with pesticides or alternative techniques, and protection of host animals from vectors by using repellents or housing susceptible animals when the vector species are active.

An inactivated vaccine has been developed in Japan for Getah virus. It is used annually for vaccination of horses in virus enzootic areas. The vaccine is not available in the United States.

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(Dr. Peter J. Timoney, Department of Veterinary Science, University of Kentucky, Lexington, KY 40546-0099, (606) 257-1531)

Questions about the FAD Report may be sent to:

Dr. Edwin I. Pilchard, Editor
USDA, APHIS, VS
Room 741, Federal Building
6505 Belcrest Road
Hyattsville, MD 20782

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